

In his review de Winter summarizes well the contents of the book that there is not much point repeating that here. Some final comments of the review in terms of the great benefits of this compilation are however worth re-stating. "The authors have in the Genera Graminum brought together a vast amount of information and successfully summarized progress made during the last decades in grass taxonomy. All agrostologists are in their debt. In the light of the strongly traditional, and not entirely consistent approach followed, a 'modern' synthesis of the generic classification of the grasses has, in my opinion, not been fully achieved. This is most likely what the authors themselves meant to convey when they advised the reader that '...there is something here to annoy everyone, so do not bother to chastise – think rather to improve.' We await a definitive treatment of grass genera in the future." Whether this is a possible goal in view of the degree of subjectivity in our methods of circumscribing genera, is debatable. However techniques of accumulating data (Watson 1987) and analyzing it cladistically (Kellogg 1987) and phenetically (Baum 1987) with the aid of computers, give hope for the future.

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R.D. Webster. *The Australian Paniceae (Poaceae)*. Berlin and Stuttgart: J. Cramer, 1987.

This book is a precursor to the Flora of Australia account of the Paniceae. The descriptions and keys have been computer generated using the DELTA package of M. Dallwitz (1986) and are an extension of those produced by the same author for the genus *Digitaria* (Webster 1984), both a result of three years spent at the Taxonomy Unit of the Research School of Biological Sciences on a grant from the Australian Bureau of Flora and Fauna, through the Australian Biological Resources Study scheme. Thus far

these are the only two accounts of grasses to be produced by the DELTA system at species level and this is the first floristic account. The computer generated keys and descriptions of grass genera from the Taxonomy Unit are now well known documents of the state of the art of the DELTA system (Watson & Dallwitz 1985 & 1988).

The 308 taxa of Australian Paniceae recognized by Webster are described against a character list of 208 characters, of which 42 are confined to vegetative characters, 52 to inflorescence characters, 104 to spikelet characters and one for chromosome number, where known. Other information given includes native or introduced status, distribution by state and the botanical regions of Barlow (1984) and vegetation regions of Moore (1975), moisture requirements, flowering period, general remarks, representative specimen citations and relevant literature citations. In addition the full character list is given and distribution maps of all entities are arranged alphabetically at the end of the book.

The arrangement of the text is alphabetical by genus and species, with keys to species (where appropriate) being placed after the generic descriptions and remarks on the genera. The DELTA descriptions are of the usual form, in that they are comparative, and follow a standard character sequence, punctuation and terminology. A full stop indicates the end of a sequence of characters describing a primary feature, a semicolon separates the characters and a comma is used where more than one character state occurs. Additional comments covering information not mentioned by the character list are contained in brackets.

The publication of this floristic compilation within a relatively short time of the completion of the research work is indeed a very impressive feat, both a function of efficiency of the DELTA system and the author's good manipulation of the system and of the diligence of the author himself.

Before any comments are made concerning observed deficiencies of the work a few comments on the DELTA system and my experiences in using it, both with Webster's data, generously provided on tape from the Taxonomy Unit, and my own data set on the Andropogoneae, are worth making. Webster uses one items file (data base on taxa) for both genera and species whereas for the Andropogoneae I created separate files for the species of each genus and for the genera; in this way I found the generation of descriptions and keys to be more manageable in terms of the different sorts of characters that constitute genera from those that make up species. Furthermore extreme care has to be taken in weighting the characters required for key generation as opposed to those needed for inclusion in a description. I feel that in the Webster keys some characters which are difficult to discern have been included in the keys (in some cases the only differentiating character) whereas they are essentially only should be included in descriptions. Examples are couplet 14 of the key to genera (concerning disarticulation of the spikelet) which cannot always be used as it depends on the age of the plant, and couplet 29 of the same key (concerning the shape of the pedicel apex) as the character is difficult to apply (see comments on the same character later in the discussion on the key to the species of *Digitaria*). An anomaly I discovered generating keys with the Webster Paniceae data set was that sometimes a genus keyed out separately from its constituent species when a key to both was generated. An example is the key to the species of *Cenchrus* when the genus and four species (*C. echinatus*, *C. robustus*, *C. incertus* and *C. longispinus*) are keyed out as having the upper lemma smooth whereas the remaining species (*C. elymoides*, *C. biflorus*, *C. setiger*, *C. ciliaris*, *C. brownii* and *C. australis*) are keyed as having the upper lemma muricate. Although the anomaly is not reflected in any keys in the book itself, it does show up in the descriptions of the relevant taxa.

In a number of cases Webster places together species of Paniceae where he regards them as being glabrous and hairy forms of one species; however the grounds for such a decision seem rather flimsy to me without any experimental evidence, and I prefer not to follow this move. Examples are the placing of *Brachiaria notochthona* with glabrous spikelets with *B. gilesii* (treated as a *Urochloa* by Webster), and the placing of *B. windersii* with hairy pedicels in synonymy with *B. praetervis* (as a *Urochloa*).

In a few cases Webster presents results which are not taxonomically correct. For example he confuses the identity of *Digitaria milanjiana* with the form of *D. eriantha* subsp. *pentzii* previously called *D. decumbens* and commonly known as Pangola Grass.

The former species is in Australia but is only known in cultivation, whereas the latter cultivar has escaped and become established in a number of fore-dune regions in Queensland. The species *Pseudochaetochloa australiensis*, a dioecious species previously only thought to have been collected in the male state, is now known to be represented in the female state by the grass *Pennisetum arnhemicum* (Macfarlane, pers. comm.). This fact was apparently known to Webster but there is no indication of it in his text. Two species of *Oplismenus* (*O. aemulus* and *O. imbecillis*) are placed together in synonymy under *O. hirtellus* (also incidentally treated in the same way by Davey & Clayton 1978), but the two are distinctly different, particularly the leaf shapes, and grow sympatrically in the rain-forest floors of south-eastern Australia. Within the same genus the variety *mollis* of *O. undulatifolius* is placed in synonymy with the type variety from Italy. However the entity is morphologically different, probably a function of its phytogeography, if indeed it is the same species. For the time being I am following the status given it by Vickery (1975).

In a few cases I think Webster incorporates too much variation in spikelet size in some of his species and the situation is better expressed taxonomically if recognition is given to the more discrete entities. An example which comes to mind is the native *Hymenachne acutigluma* which has bigger spikelets than the South American *H. amplexicaulis* but is placed in synonymy with the latter species. The neotropical species has recently been established as a pasture plant in Australia and is likely to become naturalised so it is useful to be able to tell them apart. Another example are the two native species *Eriochloa australiensis* and *E. longiglumis*, which have been placed together by both Webster and Vickery (1975) but the latter has spikelets which are distinctively longer. *Cenchrus pennisetiformis* is placed in synonymy with *C. ciliaris* but the character of basal bristle fusion, disclaimed by Webster, can be applied consistently. On the other hand *C. australis* R. Br. is resurrected from *C. caliculatus* on the grounds of having smaller involucre and spikelets but I do not consider these characters to be of sufficient magnitude to warrant specific delimitation.

There are a few examples of Webster's names being replaced by more correct names; these may not have been known to the author or were published at about the same time. Examples are *Holcolemma dispar* W. Clayton for *Paspalidium inaequale* (F. Muell.) Hughes (Clayton 1987), *Panicum laevinode* Lindley for *P. whitei* J. Black (Jacobs 1984) and *Ichnanthus pallens* var. *majus* (Nees) Stieber for *I. vicinus* (Bailey) Merr. (Stieber 1987). Lazarides (1980) has *Panicum luzonense* Presl (a name not mentioned by Webster) as a synonym of *P. cambogiense* Balansa but this was published 60 years before Balansa's name; if they apply to the same species the former is the correct name. *Cenchrus setigerus* is wrong botanical Latin and must be corrected to *C. setiger*.

Species omitted by Webster include *Arthragrostis aristiglumis* B. Simon, *Echinochloa picta* (Koenig) Michael and *Paspalum wettsteinii* Hackel. *Spinifex* × *alterniflorus* Nees is mentioned in the text but not keyed out.

The key to *Digitaria* is essentially the same as Webster (1984). The basic flaw of this key is that the character of pedicel apex is confused in definition (for example I find the distinction between the three states of truncate, cupuliform and discoid, as illustrated by the photographs referred to, very difficult to apply) and yet is used as the first entry to the key.

The big taxonomic decision made in this book, resulting in many nomenclatural changes, involves the transfer of all species of *Brachiaria* except *B. eruciformis* and of *Panicum maximum* to the genus *Urochloa*. This is based on a group of characters previously not considered instead of the classical differences, the main one of which is spikelet orientation. These new characters include texture of the upper lemma, point of disarticulation of the spikelet and whether the upper lemma is mucronate. Other characters based on leaf anatomy (Hattersley 1987) support these findings to a certain extent. While Webster's ideas certainly appear to have merit I feel to accept the changes for Australia before a study has been made on the generic limits of these genera as a whole is slightly premature. Such work is currently being undertaken at the University of Oklahoma and the outcome of the research based on many characters and all relevant species is awaited.

The distribution maps at the end of the book give a good impression with the actual distributions laid over the geobotanical regions of Barlow (1984). Flora of Australia

policy is now to follow Barlow's revised botanical regions (Barlow 1986) so that Webster's maps will have to be redrafted for the official Flora account. In most maps the area occupied by an entity is completely blocked out but in others (e.g. some species of *Digitaria*) the area is covered by a mosaic of dots; one technique would have sufficed. The method of construction of the maps is rather a mystery in terms of the numbers of specimens that were examined. In the case of the Brisbane material that was loaned to Webster only about 10% of the Paniceae was actually requested. A comparison with the HERBRECS generated maps from the Queensland Herbarium revealed a fairly close similarity for most species that were compared.

The native or introduced status of a number of species is different from that previously recorded. Two examples are *Pennisetum alopecuroides* (L.) Sprengel and *Panicum incomitum* Trin., both regarded by Webster to be introduced but thought of by others to be native.

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